PAPERS.

37. Some Alcyonaria and a *Stylaster* from the West Coast of North America.

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(Plate I.* and Text-figures 1–5.)

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Although there have been several contributions to our knowledge of the marine fauna of the north-west coast of the American continent in recent years, the Alcyonaria are almost unknown. A long while ago specimens of a very large and remarkable Sea-pen (*Osteocella septentrionalis*), from the British Columbian fishing-grounds, were examined and described, but apart from this solitary example there is no record in the literature of Zoology, so far as I have been able to discover, of any other species of the Alcyonaria from this region.

The division of sea-areas into zoo-geographical regions is always a matter of great difficulty and controversy, and particularly so along an uninterrupted coast-line extending from the Arctic Circle to the Equator. Nevertheless, the study of the marine fauna of the western coast of the North American continent shows such changes in character as we pass from north to south, as to justify an attempt to name and define regions of distribution.

Such an attempt will not be made in this paper, but there is just one point bearing upon this division into regions upon which the study of this very small collection of Alcyonarians may throw some light.

In his papers on the Mollusca of the west coast of N. America, Dall (1898) has given the name Oregonian region to the shore-waters extending from Point Conception, near the south boundary of Upper California, to, and including, the Aleutian Islands.

Subsequent authors have noticed a remarkable change in the character of the fauna in the neighbourhood of the Straits of Fuca, the exit of Puget Sound, which would justify the subdivision of Dall's Oregonian region into two nearly equal

* For explanation of the Plate see p. 557.

subregions, one north and the other south of the British-American frontier.

There is, of course, no zoo-geographical barrier between these two subregions, and we should expect to find considerable overlapping, some of the characteristic southern genera appearing in the northern subregion and *vice versa*.

One of the characteristic features of the northern subregion is the occurrence of genera and even species that are familiar to us on our North Atlantic coasts, suggesting that they are the representatives of a circumpolar fauna. Thus Professor Herdman (1898, p. 249), writing about some simple Ascidians collected in Puget Sound, says, "I think it may with truth be said that all the Ascidians I collected in this arm of the N. Pacific are closely related to familiar species on our own North Atlantic coasts. This, taken with the similarity between the two faunas shown in other groups, suggests the possibility that there is a common northern circumpolar marine fauna which extends southwards on the western coasts of Europe and America." This view is supported by Walker (1898, p. 269), who says, in writing on the Crustacea collected by Herdman in the same locality, "Besides the species in the collection that are absolutely identical with the British species, the resemblance between others is remarkable."

In an account of the Hydroids of the Alaskan expedition (1910, p. 179), Nutting gives reasons for believing that Puget Sound is a natural region of demarcation between faunæ, but Fraser (1911), in his account of the Hydroids of the Vancouver Island region, considers that there is no justification for a statement that there is a distinct break at any point along the coast. "At the present time," he says (p. 7), "out of a total of 196 species there is a record of 155 species from the Vancouver Island region and north of it, and 88 south of that region. No less than 47, or 24 per cent. of the whole number, are common to the two. Furthermore, 22 species that are found north of Vancouver Island are found in the Vancouver Island region as well as in the region south of it."

As regards the Alcyonarian fauna of the Oregonian region, we possess some knowledge of the genera and species found on the coast of California, *i. e.* the southern subregion, thanks to the researches of Nutting and others, recently summarised and revised by Kükenthal (1913), and it is therefore of no little interest to compare them with the few species collected off Vancouver Island and in the Gulf of Alaska that are described in this paper.

The following is a list of species of Alcyonaria now known to occur in the region of Puget Sound and north of it :—

Clavularia moresbii.
Paragorgia arborea.
Primnoa willeyi.
Caligorgia fraseri.
Psammogorgia teres (sp. ?).
Osteocella septentrionalis.

Two of these six species belong to genera (*Paragorgia* and *Primnoa*) that do not occur in Kükenthal's list. As regards the Sea-pen, *Osteocella septentrionalis* (Hickson, 1911), it may be a matter of controversy whether we are justified in separating the species from the genus *Pavonaria*, of which two species (*P. californica* and *P. willemoesi*) have been described from Californian waters, but there seems to be little doubt that the species is quite distinct.

Clavularia moresbii is closely related to, but quite distinct from, the *C. pacifica* of Californian waters. The genus *Clavularia*, however, being cosmopolitan in distribution and having many very variable species, does not afford much assistance in the determination of marine zoological regions.

The genus *Psammogorgia*, on the other hand, appears to have principally a tropical and temperate distribution, and the occurrence of one species north of the Straits of Fuca may be regarded as an example of the fauna of the southern subregion overlapping the boundary-line. Three species of this genus have been described by Nutting from Californian waters, but I have found the determination of species of *Psammogorgia*, without the examination of type-specimens, so extremely difficult that I feel great hesitation in my identification of the Vancouver specimen as *Ps. teres* and can make no further comments upon it.

The genus *Caligorgia* has many species in the Pacific Ocean, but according to Versluys (1906, p. 169) it is unknown in the North Atlantic. The species found off the coast of California (*C. kinoshitæ*), however, is quite distinct from the species described in this paper from the Gulf of Alaska.

The occurrence of a specimen of *Stylaster* in the Vancouver seas is of interest, because it belongs to the same form or subgenus (*Allopora*) that occurs in the Norwegian fjords, and not to the form or subgenus (*Stylaster*) which is so common in tropical and subtropical waters. It has been previously described by Verrill from the coast of California, but is probably a migrant from the north.

To summarise the results, it may be said that in this small collection three species at least (*Stylaster norvegicus*, *Paragorgia arborea*, and *Primnoa willeyi*) are representatives of a circumpolar fauna, one (*Psammogorgia teres*) is a representative of the south coast fauna, and the other three (*Clavularia moresbii*, *Caligorgia fraseri*, and *Osteocella septentrionalis*) may represent a common Pacific element which extends both north and south of the line between the two subregions.

A comparison of the list of species described in this paper with Kükenthal's list of Californian species shows that not a single species of Alcyonaria (except possibly the *Psammogorgia*) has been found both north and south of the Straits of Fuca, and seems therefore to justify a division of the Oregonian region at that point into two subregions. The specimens I have been able to collect together may represent only a small fraction of the

Alcyonarian fauna of the Columbian and Alaskan waters, and subsequent researches may modify any deductions that may be drawn from them, but so far as our knowledge extends at present the facts are significant.

I wish to acknowledge my indebtedness to Professor A. Willey, F.R.S., and to Mr. McLean Fraser for the specimens described in this paper; to Miss Constance M. Lightbown, B.Sc., for much valuable assistance in making preparations and drawings, and to Mr. J. T. Wadsworth for taking the photographs (Pl. I.) and for the drawing of text-figure 3.

Order STYLASTERINA.

Stylaster (Allopora) norvegicus Gunnerus. (Pl. I. fig. 3.)

Millepora norvegica Gunnerus, 1768.

Allopora californica Verrill, 1868, Essex Inst. vol. v.

Allopora oculina Moseley, 1881, 'Challenger' Reports, vol. ii. p. 85.

Stylaster norvegicus Broch, 1914, Danish 'Ingolf' Expedition.

Swiftsure Shoal, off Barkley Sound, W. coast Vancouver Island.

Local name. Roseate stag's horn coral.

A single dried specimen of this *Stylaster* was taken by Professor McMurrich from the Swiftsure Shoal.

It is 45 mm. in height, with seven short blunt branches arranged in a single plane. One of the branches shows a barnacle-gall. As there is no base of attachment, the specimen may be a branch of a much larger colony.

The main stem is 10 mm. in diameter, and the branches about 5 mm. in diameter.

The cyclosystems are evenly distributed on all sides of the branches, and they are not more numerous on one side of the flabellum than on the other. Each cyclosystem projects slightly from the surface of the cœnosteum and is about 0·75 mm. in diameter.

The number of dactylopores in each cyclosystem varies, but in the majority of cases there are 6 or 7. There is a large brush-like style in the gasteropore and a very small style in each of the dactylopores. No ampullæ can be seen on the surface of the cœnosteum, but at the broken base a few small cavities (0·5 mm. in diam.) may be seen which are probably young ampullæ.

The colour is salmon-pink.

The difficulty of separating the two Stylasterid genera *Allopora* and *Stylaster* was pointed out ten years ago by myself and Miss England (1905, p. 6). Broch (1914), agreeing with our view on this matter, has included *Allopora* in the genus *Stylaster*, retaining the name *Allopora* as a subgeneric name for species of *Stylaster* included in our group of species D. "For group D the old generic name *Allopora* should be retained." This is clearly

an error. According to our definition of the groups, group D has cyclosystems on the anterior surface of the branches only. It is group C which has the cyclosystems evenly distributed over the surfaces of the branches. In *Allopora norvegica*, according to Broch's own description and figures of the species, as well as in the Cape species (*Allopora nobilis*), the cyclosystems are distributed on all sides of the branches, they are certainly not confined to the anterior surface of the flabellum, as they are in the species of our group D.

The subgenus *Allopora*, however, is usually distinct from the other subgenus *Eustylaster* of Broch, not only in the character given to our group C—that the cyclosystems are distributed on all surfaces of the branches,—but also in two ill-defined but still mutually dependent characters, namely, that the terminal branches are relatively thick, and that the ampullæ do not project or project slightly from the surface of the cœnenchym.

Returning now to our species from Vancouver Island. It clearly belongs to our group C, as the cyclosystems are more or less evenly but irregularly distributed on all sides of the branches. It may therefore be placed in the subgenus *Allopora* of the genus *Stylaster*. The determination of the species is a much more difficult matter in the absence of any information about the ampullæ or gonophores. The characters of the cœnosteum, as seen without fracture, are similar to those of the species from the Norwegian coast except in respect of colour, which is salmon-red instead of white or faintly rose. The colour-difference by itself does not seem to me to be a character upon which it is wise to establish a distinct species, and therefore I am disposed to regard the species as identical with the Norwegian species.

The proper name of this species has recently been discussed by Broch (1914, p. 17), and I am in agreement with him that it should stand as *Stylaster* (*Allopora*) *norvegicus* Gunnerus. Whether this species is identical or not with the *Allopora oculina* of Ehrenberg cannot be determined with any degree of certainty, but there can be little doubt that it is the same as the *Allopora oculina* of Moseley's 'Challenger' Report (1881, p. 85).

It seems very probable that the species is also identical with Verrill's *Allopora californica* from deep water off the coast of California. Verrill's specimen was 3 inches (75 mm.) or more in height, had cyclosystems ·02 inch (0·5 mm.) in diameter, with, usually, six dactylopores, and was light "minium" red in colour. From the description there are no points of distinction of this form from *Allopora norvegica*, except colour.

Note on the Gonophores of the Stylasteridæ.

In his recent work, Broch (p. 20) attributes to Moseley the view that the gonophore of the Stylasteridæ is a special formation in the group, and is not homologous with the adelocodonic gonophore of other Hydrozoa. This was certainly not Moseley's

view, and when I suggested it to him he expressed to me personally his disagreement with it. The term "trophodisc" was suggested by myself and was never used by Moseley at all.

As regards the view itself. It was expressed as a result of a long investigation of the development of the gonophores of a *Stylaster* (*Allopora*) from the coast of Norway, and every fact described was confirmed by the examination of many comparable preparations. Knowing now, after twenty-five years' experience of this group, better than I did then, the difficulty of the investigation, I realise the probability that some stages in the development may have been missed. Moreover, the study of Kuhn's excellent memoir on the development of the gonophores of Hydrozoa has to some extent shaken my faith in my own view; but the homology of the gonophores of Stylasteridæ with the adelocodonic gonophores of other Hydrozoa has not yet been proved, and will not be established by scattered observations on a few stages of the development of the male gonophore alone. The principal difficulty in accepting the older view held by Moseley arose from my observations on the development of the female gonophore, and until this investigation has been repeated with more modern methods of study than I had at my disposal in 1890, the true homologies of these organs must remain undetermined. In the meantime the discovery that *Millepora*, notwithstanding its calcareous skeletal structures, does give rise to free-swimming medusæ, has removed one of the principal initial difficulties I felt in believing that the gonophores of Stylasteridæ could represent reduced medusæ, and I am quite prepared, when the time comes, to abandon my own view in favour of the more conventional and older one of Moseley.

Order ALCYONARIA.

Family Clavulariidæ.

Clavularia moresbii, sp. n. (Pl. I. fig. 4; Text-fig. 1.)

W.S.W. off Moresby Island, 100 fathoms.

The widely distributed and very variable genus *Clavularia* is badly in need of revision. It is probable that such a revision would lead to a considerable reduction in the number of the species, many of which have been founded on very inadequate characters. Nevertheless, the specimens from Moresby Island show very distinct specific characters and must be regarded as the type of a new species.

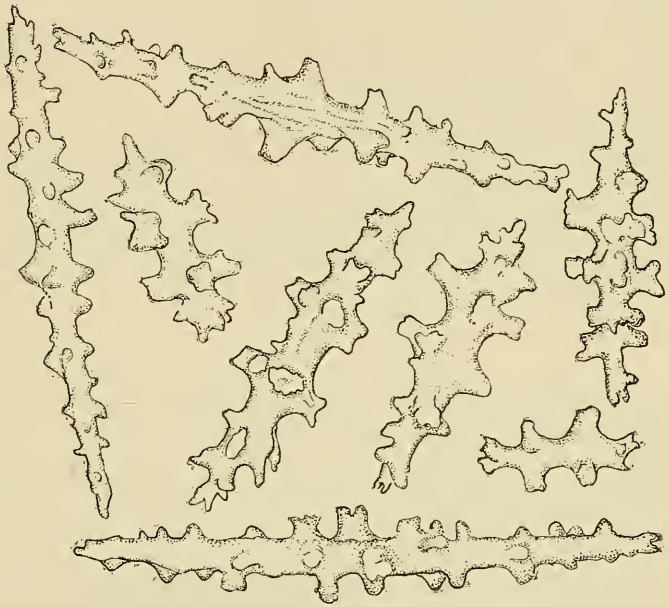
The genus is well represented both in the Norwegian waters and in the North Pacific Ocean. The occurrence of a species in British Columbian waters might have been anticipated, and in itself is not a fact of any zoo-geographical importance.

The specimens were obtained by Prof. Willey in 1914, who writes that these whitish "rose-headed" Clavularias were growing

on the stem of the Gorgonid (*Primnoa willeyi*). They were preserved and forwarded to me in formalin.

The stolon is in the form of flat anastomosing bands, spreading out in places and fusing to form membranes. From the stolon the zooids arise in a very irregular manner, in some places at considerable intervals, in others close together. The stolon follows the support in a quite irregular manner, and, so far as can be determined from the material at my disposal, is never thickened to form a sympodium. The zooids are never retracted into the stolon, but they all show the tentacles contracted tightly over the oval disc. They vary very much in size, large and small ones being irregularly distributed on the stolon.

Text-figure 1.



Spicules of *Clavularia moresbii*. × 350 diam.

The larger zooids are from 7–10 mm. in length, with a diameter of 2 mm. The crown of tentacles is never retracted into a calyx, and the aboral surfaces of the eight tentacles forming the apex of the zooid, in the preserved state, therefore can always be seen. The body-wall is smooth and cylindrical. It does not shew, as preserved, the eight longitudinal furrows that have been described in many other species of the genus.

The spicules (text-fig. 1) are tuberculated spindles 0·15 mm.–0·2 mm. in length by about 0·05 mm. in diameter, and do not

shew a tendency to become club-shaped. They are densely crowded both in the tentacles and body-wall, and are nearly all arranged in a direction parallel with the long axis of the zooid.

The species seems to be most closely related to *Clavularia pacifica* (Kükenthal, 1913, p. 237) from the coast of California, previously described by Nutting (1909, p. 686) as *Sympodium armatum*. This species, however, differs from *Clavularia moresbii* in having stouter and more retractile zooids (5 mm. × 2 mm.), with eight deep longitudinal grooves and larger spicules (0·25–0·3 mm. in length). The spicules, moreover, are much more crowded together in *Clavularia moresbii*, and do not show in such marked degree as in *C. pacifica* a transverse disposition at the base of the tentacles, and I cannot find in my preparations any spicules that by becoming thickened at one end show a tendency to be club-shaped.

In *Clavularia eburnea* (Kükenthal, 1906, p. 14) from Japanese waters the zooids are larger (12 mm.), but in the spicular armature and in other characters *C. eburnea* is more closely related to *C. pacifica* than it is to *C. moresbii*.

But, although the relationship of our new species with the Californian species *C. pacifica* is pronounced, it must be pointed out that its relationship with some of the Norwegian species, such as *C. borealis* of Koren and Danielssen (1883, pl. i.), may be as close, and it affords therefore no special reason for regarding the fauna of British Columbia as being more closely related to the Pacific than to the N. Atlantic fauna.

Family Briareidæ.

Paragorgia arborea Linn. (Text-fig. 2.)

Alcyonium arboreum Linnæus, Syst. Nat. 10th edit. 1758, p. 803.

Alcyonium arboreum Pallas, Elenchus Zooph., Edit. Wilkens, 1787, pt. 2, p. 164.

Paragorgia arborea Milne-Edwards, Hist. Nat. Cor. 1857, t. 1, p. 190.

Paragorgia nodosa Koren & Danielssen, Nye Alcyonider, etc. 1883, p. 19.

? *Paragorgia nodosa* Nutting, Pacific Alcyonaria, 1912, p. 99.

? *Paragorgia regalis* Nutting, l. c. p. 100.

Off Kodiak Island, Gulf of Alaska. Depth ? 1 specimen.

Local name. Friable brick-red coral.

In Wilkens' edition of Pallas' 'Elenchus Zoophytorum' there is a long account of this species, probably copied in great measure from the writings of Koelreuter (1761). There can be no doubt from this that the *Alcyonium arboreum* of Linnæus and Pallas is the same species as the common species of the Norwegian fjords, now known as *Paragorgia arborea*.

Although the external features of the species were fully

described by Koelreuter, and measurements and illustrations of the spicules of *Paragorgia nodosa*—which does not seem to me a distinct species—are given by Koren and Danielssen, there is no good modern description either of the genus or species.

The genus, however, seems to be quite well distinguished from others of the same family by the very well-marked dimorphism of the zooids and by the characters of the spicules. The occurrence of dimorphism in the genus, first recorded by myself in 1883, is of importance because it is of only exceptional occurrence in the *Pseudaxonia*, and can be clearly determined, not only in fresh and spirit specimens, but also in specimens that have been dried for many years.

The geographical distribution of *Paragorgia arborea* cannot be very accurately determined from the literature. It is probable that some of the specimens from the Mediterranean Sea and Atlantic Ocean, refered to *Alcyonium arboreum* by the older naturalists, belonged to a different genus or species. Of recent years there is no record of any specimens being found outside the area of the Norwegian coasts. It was not found by the 'Challenger' Expedition in the Atlantic, nor is it recorded from the deep water off the west coast of Ireland by the Irish Fisheries Investigations.

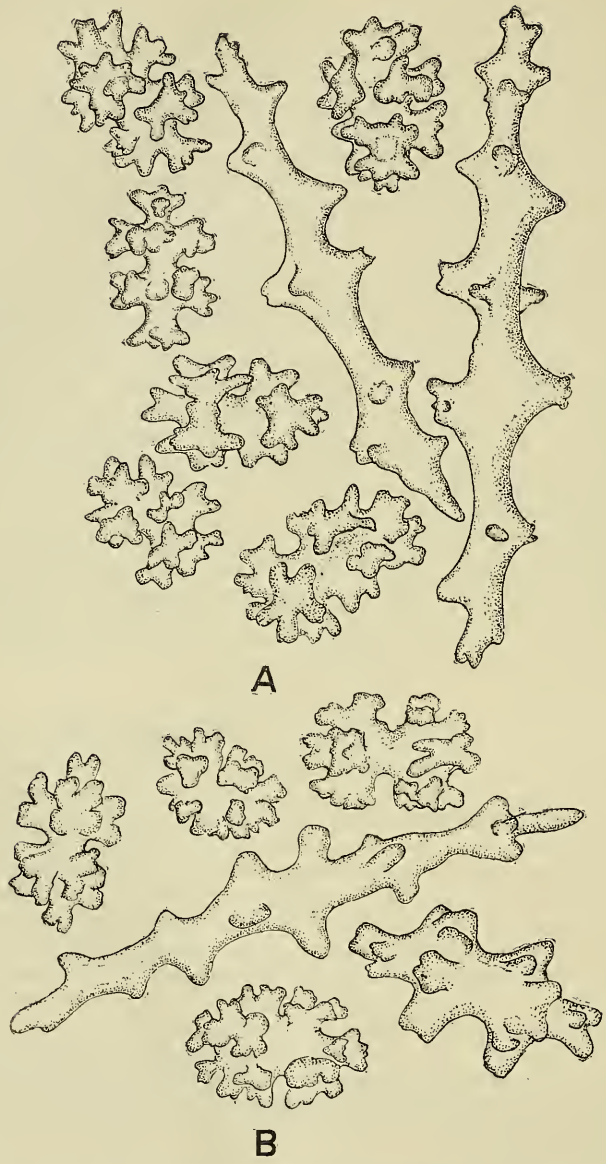
It was therefore with some surprise that I found, in the collection sent to me by Mr. Fraser from the Gulf of Alaska, a specimen that was clearly a species of *Paragorgia*. For comparison with the Alaskan specimen I have examined a specimen of *P. arborea* from the Trondhjem Fjord, and I have no hesitation, after making this comparison, in placing the two specimens in the same species.

The specimen is probably only a fragment of a large colony, but it shows a simple bifurcation at the distal end. It is 170 mm. in length. The stem at the base is oval in section (14 × 18 mm.). As in the specimen from Norway, the stellate pores of the autozooids are scattered irregularly in clusters all round the stem, many of the clusters being mounted on dome-shaped prominences from the surface. The pores of the siphonozooids are numerous, quite irregularly distributed, and easily seen with a hand-lens. The axial part of the stem is creamy-white in colour, and is penetrated by canals corresponding in arrangement with those in my specimen of the type-species. The crust, or outer layer, of the stem is about 1 mm. in thickness, and is distinguished by its brick-red colour.

The spicules of the autozooids are irregularly tuberculated spindles, of which the larger ones are about 0·25 mm. in length. These spicules are probably distributed in the tentacles or body-wall of the anthocodiæ of the autozooids, but I cannot determine this with certainty.

The spicules of the cœnenchym and axial region are double stars of the type shown in Kölliker's 'Icones,' pl. xviii. fig. 45. They are of nearly constant size, 0·07 mm. in length.

Text-figure 2.



A. Spicules of *Paragorgia arborea* from Alaskan coast. × 375 diam.

B. Spicules of *Paragorgia arborea* from coast of Norway, for comparison with A. × 375 diam.

A comparison of the preparations of spicules, made from the Alaskan specimen and from the Norwegian specimen, shows that there is very little difference either in size or shape between the spicules of the two specimens. In fact, the preparations can hardly be distinguished without the assistance of the labels (text-fig. 2, A, B).

In a recent paper, Nutting (1912, p. 99) has described two species of the genus from the Japanese seas, one he attributes to the species *P. nodosa* of Koren and Danielssen and the other to a new species, *P. regalis*. It does not appear to me that either of these species is very well defined from the type-species, but without examination of type-specimens from Japan it is impossible to determine with certainty whether they are identical with *P. arborea* or not.

Family Primnoidæ.

Subfamily Primnoinæ.

Primnoa willeyi, sp. n. (Text-fig. 3.)

Locality. W.S.W. off Moresby Island, British Columbia, 100 fathoms.

Concerning this species Prof. Willey writes: "In fishing for halibut a magnificent scarlet Gorgonid was brought up on one of the hooks. It was four feet in height, with a diameter at the broken off base of 1·5 inches. The branches anastomose and the axis is black and horny."

Specimens of the *Clavularia* described above were growing on the base of the horny stem of this *Primnoa*.

The only specimens sent to me were a number of fragments well preserved in formalin. I am unable therefore to give an account of the colony as a whole or its method of branching. The method of branching, so far as I can judge, is dichotomous, but I have no evidence of the anastomoses referred to by Prof. Willey.

The structure and arrangement of the zooids, however, afford sufficient evidence to show that the species is not identical with any that has hitherto been described.

At the time of the publication of Versluys' memoir on the Primnoidæ (1906), there was only one well-established species of the genus, the well-known *Gorgonia reseda* of Pallas, subsequently called *Primnoa lepadifera* by Lamouroux.

Since that date Kinoshita (1908, p. 42) has described a new species, *Primnoa pacifica*, from the Sagami Sea.

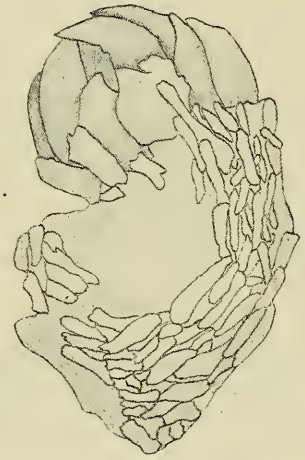
The genus *Primnoa* is distinguished from other Primnoinæ by the irregular distribution of the zooids on the branches—or, in other words, the zooids are not arranged in definite whorls nor in definite spirals. Moreover, it seems to be a character of the two known species that the zooids are bent downwards away

from the apex of the branches, instead of upwards towards the apex of the branch, as they are in most of the Primnoinæ.

In the specimen from British Columbia, the terminal branches including the zooids are about 6 mm. in diameter and excluding the zooids about 3 mm. in diameter. The zooids are quite irregularly distributed on the branches, larger and smaller ones being mixed, and they are all bent downwards towards the base of the branch. The larger zooids are about 5 mm. in length by about 1·5 mm. in diameter.

The opercular scales are triangular in shape, with a very well-marked keel passing along the adoral side from the apex towards the base. These scales are 1·5 mm. in length (from apex to base) and 0·6 mm. in breadth. Behind and partly overlapping the

Text-figure 3.



A single zooid of *Primnoa willeyi*. × 15 diam.

opercular scales on the abaxial side there is a half circle of large oblong scales 1·05 × 0·75 mm., and arranged very irregularly over the rest of the abaxial side there are long narrow scales of various sizes up to 1·8 mm. in length by 0·2 mm. in breadth (text-fig. 3). Some of these elongated scales occur on the adaxial side of the margin of the zooid overlapping the opercular scales, but the greater part of this side of the zooid is naked.

In *Primnoa reseda* and in *Primnoa pacifica* there is less difference between the marginal scales and the other scales of the abaxial side of the zooids, and in both these species the zooid is more completely covered and protected by square or oblong scales.

The new species differs from both the other two species, not

only in the shape and arrangement of the scales as described above, but also in the actual size of the larger zooids.

I have compared them with the zooids of a specimen of *P. reseda* from Norway, and found that, whereas the measurements of spirit-specimens of *P. willeyi* are 5 mm. by 1·5 mm., in dry specimens of *P. reseda* they are 7 mm. by 3 mm. In *P. pacifica* the zooids are said to be 5–7 mm. in length, and from the figure are evidently broader and stouter than in *P. willeyi*.

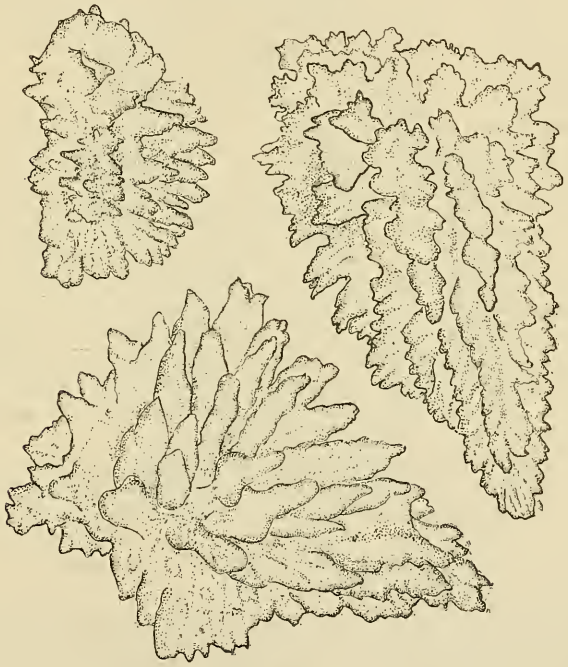
Caligorgia fraseri, sp. n. (Pl. I. fig. 2; Text-fig. 4.)

Gulf of Alaska, 50–100 fathoms.

Local name. "Verticillate fan-coral."

This new species is represented by two dried specimens 220 and 130 mm. in length respectively. The base of attachment is

Text-figure 4.



Scales of *Caligorgia fraseri*. × 280 diam.

missing from both specimens, and consequently they may represent portions of a larger colony. The branches arise alternately, but irregularly, from the main stem (or branch) in one plane. The diameter of the largest stem, including the whorl, is 3·5 mm., and of the axis 2 mm.

The zooids are arranged in closely-set but not overlapping whorls. In the thickest branches there are 11 or 12 zooids in each whorl, but they diminish to 5 or 6 in the more slender distal branches. The zooids are about 1 mm. in length by 0·5 mm. in diameter, and are closely adpressed to the side of the branch.

The zooids are protected on the abaxial side by three or four longitudinal rows of overlapping scales, but the axial side is free from scales except at its distal extremity. The apex of each zooid is protected by a complete circle of triangular opercular scales.

The large abaxial scales are round or oval in shape, and the outer surface is ornamented with numerous long spiny tubercles which radiate outwards from a common centre.

It is the presence of these remarkably long tubercles on the scales that constitutes one of the most important characters of the species. These scales attain a size of 0·3 mm. × 0·23 mm. The triangular opercular scales are also covered with long tubercles, and their size may be 0·28 mm. in height by 0·2 mm. at the base.

In addition to the abaxial plates and opercular scales, a preparation of the spicules of a zooid reveals a number of smaller scales and irregular tubercular calcareous nodules. The exact position of the latter cannot be determined owing to the density of the plates which cover them, but they probably correspond with the deep-seated warty sclerites described by Versluys (1906, p. 76) in *Caligorgia ventilabrum*, but far more commonly found in the genera *Primnoella* and *Primnoides*. The presence of these sclerites constitutes a second important character of the species.

The new species appears to be most closely related to *Caligorgia aspera* (Kinoshita, 1908, p. 39) from the west coast of Satsuma, Japan, from which it differs in the less profuse branching, in the smaller number of zooids in a whorl, as well as in the larger and more profuse tuberculation of the scales.

In the method of branching it is more like *C. granulosa* of the same author (p. 37), but in this species the scales are much larger. In *C. elegans* (Gray), also described by Kinoshita from the coast of Japan (p. 40), the number of zooids in a whorl corresponds more closely with that of the new species, but the tubercles on the scales are much smaller.

The specimens were taken on the Halibut lines on Albatross and Portlock banks, in the Gulf of Alaska, and are said to be pink when fresh and to be "common." They were collected by Professor A. Willey, F.R.S.

Family Plexauridæ.

Psammogorgia teres Verrill. (Pl. I. fig. 1; Text-fig. 5.)

Psammogorgia teres Verrill, Trans. Conn. Acad. vol. i. 1868, p. 416.

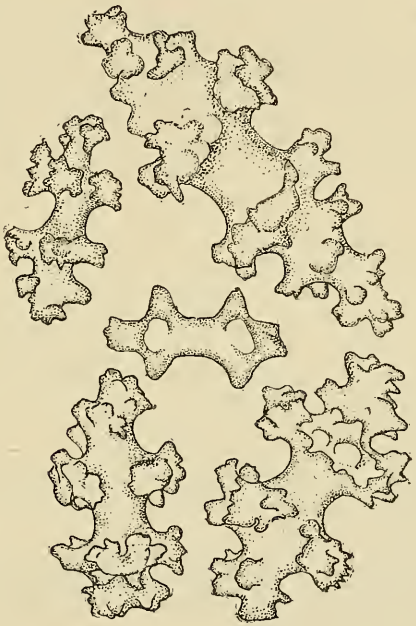
W. coast of Vancouver Island.

Local name. Coral-pink candelabrum coral.

The genus *Psammogorgia* is so badly in need of revision and full description that I refer this specimen to Verrill's species with the greatest hesitation. The type of the species was taken off Pearl Island, which I believe to be off the west coast of tropical America, in 6–8 fathoms, and is said to be rare.

The specimen from Vancouver Island is dry, and, in the presence of a flattened base of attachment, is evidently complete. It is 115 mm. in height and has six branches. The diameter of

Text-figure 5.



Spicules of *Psammogorgia teres*. × 500 diam.

the thickest branch is about 4 mm., and the branches are almost cylindrical in shape. The diameter of the axis just below the point where ramification begins is 4 mm., and the disk of attachment is thin and about 10 mm. in diameter. The crust varies in thickness from about 0·25 mm. below to 1 mm. near the terminal ends of the branches.

The positions of the zooids are marked by flat or slightly convex prominences, quite irregularly distributed over the surface of the cœnenchym, and in the centre of each prominence there is a stellate aperture.

The spicules are tuberculated spindles, very variable in size, but with an average of about $0{\cdot}12 \times 0{\cdot}04$ mm., and double stars rather smaller in size (text-fig. 5).

The genus *Psammogorgia* is represented by four species from the tropical region of the west coast of America described by Verrill (1868), and by three species from the coast of California described by Nutting (1909, p. 719). In a recent paper Kükenthal (1913, p. 268) expresses the opinion that one of Nutting's species should be referred to the genus *Euplexaura* of Verrill, as amended by him.

It appears to me very doubtful whether the genus *Psammogorgia* will stand as an independent genus, but I am not disposed, until a further study is made of the species attributed to it from the west coast of America, to merge it into the more widely distributed genus *Euplexaura*. The diagnostic characters of the species are all most unsatisfactory, and it is almost certain that if the genus stands it will stand as a single-species genus. In the meantime, I refer the specimens from Alaska to the species to which they appear to be most closely related.

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EXPLANATION OF THE PLATE.

Fig. 1. *Psammogorgia teres* (dry). Nat. size.
2. *Caligorgia fraseri*, sp. n. (dry). Nat. size.
3. *Stylaster norvegicus* (dry). Nat. size.
4. *Clavularia moresbii*, sp. n. Two zooids preserved in spirit. × 2 diam.

[NOTE.

My attention has been called to a paper by W. H. Dall, "On some Hydrocorallinæ from Alaska and California," in the Proc. Biol. Soc. Washington, vol. ii. 1885, p. 111.

In this paper three new species of *Allopora* are described from the Aleutian and Shumagin islands, namely, *A. verrillii*, *A. moseleyi*, and *A. papillosa*.

They differ in some respects from the specimen I have identified as *Stylaster* (*A.*) *norvegicus* from the Swiftsure shoal off Vancouver Island, but I do not consider, without reference to the type specimens, that these differences are sufficient to justify a specific distinction from the older species.

In this paper there is also a record of a specimen identified as *Calligorgia compressa* Verrill from the Aleutian islands, but as there is no figure or description of it, comparison with the specimen described by me as *Caligorgia fraseri* cannot be made. The type specimen of *C. compressa* is (*fide* Versluys, p. 81) only a naked axis without polyps or spicules.

December 13, 1915. S. J. H.]